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# Westinghouse

ELECTRIC CORPORATION



AIR ARM DIVISION

PHONE: SOUTHFIELD 1-1000  
FRIENDSHIP INT'L AIRPORT  
BOX 746, BALTIMORE 3, MD.

July 7, 1961

Special Projects Office (LMSA-1)  
Plans and Program Office  
Director of Production  
Wright-Patterson A.F.B., Ohio

SUBJECT: Contract AF33(600)40260

Gentlemen:

Forwarded are three (3) copies of Progress Report for the period of May 15, 1961 to June 15, 1961. One copy of this report is being transmitted [redacted]

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Very truly yours,

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[redacted]  
Interceptor FCS Project  
Air Arm Division - 251

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[redacted]  
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12 PAGES

## Progress Report

Period of 5/15/61 to 6/15/61

Contract No. AF33(600)40280

GENERAL

Major activity for the monthly reporting period was in the design, drafting, and laboratory breadboard phases.

Approximately 25% of the fabrication drawings have been released to the Model Shop. The release of drawings is accelerating so that this should reach approximately 60% for the next period.

The chart on page 2 shows in graphical form the status of the overall program.

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Major design problem areas are:

1. Antenna - radiation pattern and temperature
2. Duplexer - resonant ring gain
3. Duplexer - switch tube development
4. Recorder - GdT-fiber optics development

Effort is being concentrated in these areas and arrangements are being made where possible to provide temporary substitute components to assure schedule continuity in the basic program.

Auxiliary Data Recorder

A proposal for adding an auxiliary data recorder to present latitude, longitude and heading data on 35 mm film was prepared and submitted.

Flight Test

A proposal has been submitted for installation and flight test of the system in an F-101-B aircraft. The proposed program includes the installation and maintenance of an Inertial Navigation System. The Inertial Navigation System as well as a reconstruction processor and a film developer are considered as government furnished equipment.

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**SECRET**ANTENNAStructure

The three honeycomb panels are being built by Rohr Aircraft Co., Chula Vista, California, due date is 1 August 1961.

Manifold Design

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[redacted] is fabricating the manifolds. They have completed approximately 90% of their engineering drawings and have released mold and tool orders. First tools are to be completed during the week of 12 June.

Array Design

Since the present slot arrangement does not meet all electrical requirements, a hold has been placed on the purchase order for the array sticks. The orders for the array sticks and tooling have been processed to the extent that they can be placed within hours of the release of the hold which is expected to be 23 June 1961. Purchase orders have been placed with [redacted] for the power divider assemblies and delivery time is to be in 100 days.

Radome Design

Efforts are continuing to improve the quality of the array stick seal and the bonding technique. Tests indicate the life expectancy of the seal to be approximately 250 hours at 550°F with many cycles of temperature variation. A parallel program has been started to investigate the practicability of using a fused silica glass sealing strip.

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All of the available elastomeric "O" rings have failed after short exposure to 550°F due to an excessive compression set. Metal "O" rings have been ordered for testing. These rings will be coated with a thin coating of the silicon adhesive in an effort to improve the low pressure sealing capacity without resorting to the superfinishes normally required with metal seals.

Load Design

An initial delivery of 19 pieces has been received and inspected. These parts have dimensional deviations from the drawing, but will be checked electrically. Future acceptance will depend on electrical testing of sample quantities of each lot received.

Drafting

All drawings are complete and have been released to the Model Shop.

Fabrication

The Model Shop is fabricating most of the minor items such as the clamps and brackets. In addition the shop is fabricating the bodies of the rod end bearings due to the excessive cost of obtaining stainless steel rod end bearings.

Mock Up

Authorization to resume work on the wooden mock up has been given.

DUPLEXER

Airtron is approximately 75% complete on component parts for the S.S.I. resonant ring and still expects to meet the end of June completion date. Replies to inquiries on 1.164" x 1.164" square cross section waveguide

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of invar-silver laminate construction are expected shortly. It is intended that this material waveguide will be used in the 3 units to be ordered by Westinghouse. [redacted] indicates that the #1 Westinghouse unit can be delivered 45 days after delivery of the [redacted]. It if invar-silver laminate information is available at the time [redacted] delivery.

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Further work on the filter (tank) type resonator will continue. Initial tests indicate gains comparable to the ring resonator supplied by [redacted]. To cover the possibility of tank resonator use, the Westinghouse Tube Laboratory will check all tube developments to 500 kw incident power hold-off.

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Sketches of space and mounting requirements for final production resonant structures have been forwarded to [redacted] will approach [redacted] relative to constructing a ring in regular large X guide as a back-up should [redacted] run into trouble on either the [redacted] ring or invar-silver laminate construction technique.

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#### Switch Driver

The Switch Driver layout is about 80% complete. Drafting should be complete in about 3 weeks.

#### Switch Tubes

Switch tube development was continued on the magnetically controlled version. Tests indicated excessive variation in firing time as the klystron power level was varied over a 5 kw range that could be expected in service.

This design has been abandoned in favor of a triggered switch tube design. This consists of a resonant structure highly evacuated to hold off RF breakdown. Inserted across this structure is a thin quartz capillary tube containing firing electrodes and filled with a gas to the optimum pressure to provide fast firing time. Preliminary measurements and extrapolation of published data indicate that required firing time can be achieved. Low level test structures are also being assembled to determine the insertion loss of the tube and what can be done to minimize it to meet the 0.05 db spec.

Power monitor

The Power Monitor has been tested in breadboard form and results indicate an accuracy of about  $\pm 10\%$  over a temperature range of  $-55^{\circ}\text{C}$  to  $+75^{\circ}\text{C}$ . This unit is now in drafting layout. The unit will be approximately 4" x 2" x 2".

MODULATOR

Tests on the breadboard modulator indicated the need for two modifications. (1) The peak voltage of the output pulse must be reduced. This will be accomplished by reducing the HV to the primary from 7.5 KV to 6.7 KV. Primary taps on the HV power supply are available for optimum adjustment. (2) The addition of backswing diode is required to discharge the klystron capacitance at the end of the modulator pulse.

The drawings are being modified to incorporate the above changes. The Model Shop has completed the bare modulator chassis and has completed assembly and wiring of the trigger generator sub-chassis.

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The filament transformer has been received from Kaytheon, and will be sent to Pittsburgh for high voltage testing.

RECEIVER

Travelling Wave Tube

Further testing has been carried out with the TWT connected to a breadboard of the TWT power supply. Operation was normal. A purchase part drawing has been created by Components Engineering for the TWT.

IF Amplifier

Drawings have been released to the Model Shop with the exception of those for coils and transformers. Drawings for these items are in the process of being completed and will be released as they become available. Release of the receiver assembly drawing is scheduled for 6/19/61.

Video Amplifier

A breadboard video amplifier including synchronous detector and a newly designed failure circuit is 100% complete and has been tested in the lab.

Drawings for the video amplifier and detector have been released to the Model Shop with the exception of the RF coils. These will be released as they become available from Components Engineering.

SYNCHRONIZER

Frequency - Generator (Variable Frequency Oscillator Section)

Previous difficulties with spurious oscillations and power have been corrected and the unit has been satisfactorily tested with the receiver. New simplified circuitry was developed which permits use of single inductors in the resonant circuits with accompanying simplification of the tuning procedures

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and increased rejection of sideband frequencies. The new circuitry permits the use of commercially available inductors. Sample quantities of these inductors are on order and receipt is expected this week.

Frequency - Generator (Fixed Frequency Oscillator Section)

The gating circuitry was reworked to provide a satisfactory off-on ratio. This section was operated with the crystal modulator and found to produce the desired results. The rest of the circuitry in this section was modified in the same manner as the variable frequency section above.

Frequency - Generator (IF Section)

This section was reworked to remove spurious oscillations and provide proper action of the double limiters.

Frequency - Generator (Oscillator-Discriminator)

This item was received from Bulova, one month late. It has been temporarily built into the breadboard frequency generator. Last phases of the testing procedure prior to connecting with other units of the system have been started.

Microwave Oscillator

The Microwave Oscillator which was ordered from the Bomarc production line has been received and turned over to the Model Shop for modification to suit the AN/APQ-93 application.

RECORDER

The first batch of Itek Recorder layouts were approved with the exception of the yoke mounting. Designs approved include reel drive, support frame, footage sensor, film motion sensor, auxiliary data projector, pinch roller and drag roller.

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During the month of May release of drawings for fabrication of mechanical components was continued. Approximately 80% are now released.

Design of the packaging of the electronic portion is being completed. Some of the sheet metal work has been released for fabrication.

A mechanical sample of the fiber optic array has been received and is being potted.

#### CRT-Optics

The development of the cathode ray tube and fiber optics is still behind schedule. Arrangements are being made to have available a unit that may have less than the specified resolution but will serve nevertheless to proceed with assembly and testing of the recorder to meet the basic radar schedule.

#### Microscope Auxiliary

Design of the microscope auxiliary for trace viewing was started. This will be used for adjustment of the cathode-ray tube trace as viewed on the end of the fiber optic array before loading film into the recorder. A protective case will be supplied for storing the device when not in use.

#### Test Set

Design has been started on a test rack to check the recorder. This will consist of a standard relay rack containing required power supplies and a control panel to simulate operation in the final system. Material is on order.

#### Film Motion Detector

The Film Motion Detector utilizing a reluctance pick-up detecting motion of gear teeth in a portion of the film drive mechanism has been further checked and provides proper operation from -55°C to +60°C.

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Focus Modulator Circuit

A Focus Modulator Circuit has been breadboarded and checked. This superimposes a signal on the 4 kv d.c. to the focus electrode of the CRT to maintain focus at the extremes of the scan.

NAVIGATION TIE-IN

Drawings have been released to the Model Shop. A laboratory test set up has been completed for checking the drift angle information unit. The gain of the servo-amplifier was increased and the phase correction of the system optimized. Check of the servo follow-up error shows an error of less than 2 minutes of drift angle. This is equivalent to 1.2 knots.

The step motor in the ground speed information unit has been checked and operates satisfactorily at 28V rms.

The accelerometer sensor units are on order. The test circuitry and test procedures required to assure proper operation have been set up.

A breadboard of the entire Navigation Tie-in unit is being built up to check for proper operation in conjunction with the accelerometer sensor and the frequency generator in the synchronizer.

POWER SUPPLY - CONTROL

The layout of the Power Supply is 95% complete and detailing has been started. Release to the Model Shop is scheduled for 7/17.

Model Shop is proceeding with fabrication of the Control Panel.

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FRAME ASSEMBLY

The design and drafting layout of the Frame Assembly is about 80% complete. A load analysis has been completed and the stress analysis is 90% complete. Detail drawings will be started during the next report period. Preliminary design work has been started on the truss required to mount the frame assembly.

Preliminary versions of the Interconnection Diagram and the Power Distribution Schematic have been completed.

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